

Gov. Doc
Can
M

Canada. Mines, Bureau of.
Explosives Division.

THE STORAGE
— *of* —
EXPLOSIVES



3 1761 12001979 9



DEPARTMENT OF MINES AND RESOURCES
BUREAU OF MINES
EXPLOSIVES DIVISION

OTTAWA, CANADA
1940

No. 17

THE STORAGE — *of* — EXPLOSIVES



DEPARTMENT OF MINES AND RESOURCES
BUREAU OF MINES
EXPLOSIVES DIVISION

—
OTTAWA, CANADA
1940

No. 17

CONTENTS

	PAGE
Introduction.....	1
Magazines—Isolation.....	2
Lightning and Fire Protection.....	2
Security.....	3
Other Features of Buildings.....	4
Maintenance.....	5
Destruction of Explosives.....	8
Detonators.....	9
Keeping of Records.....	9
Licensing.....	9
Keeping Small Supplies.....	10
Appendix A—Table of Distances (abstract).....	15
Appendix B—Plans of Magazines.....	16

INTRODUCTION

The mining and industrial developments of recent years have led, and continue to lead, to a corresponding increase in the demand for explosives. Through the labours of manufacturers and chemists, types of explosives have been evolved with properties and characteristics which have greatly widened the field of their application. Following on this, persons in all parts of the country, who formerly would have had no direct interest in explosives, now find that the use of them makes possible a saving in labour and costs in their undertakings. Because of this the distribution of explosives has extended even more rapidly than the actual increase in total quantity would suggest.

The first consideration of the merchant proposing to supply explosives may naturally be one of cost and selling price; to the prospective user it is one of obtaining suitable supplies. The question of how the explosives should be handled by the merchant or by the purchaser, pending the actual employment of them, is apt to be overlooked. Yet this is a matter which has an important bearing not only on the efficiency of the explosives, but on the safety of the public and of those in whose charge they may lie.

In this pamphlet it is proposed to review, briefly, the main considerations that should be borne in mind when making provision for the storage of explosives. These must of course vary with the circumstances of each case, being largely dependent on the quantity of explosives to be stored, on whether the provision is to be permanent or temporary, on local conditions, and on available materials. The determination of these however readily follows on an appreciation of the principles which are observed in all good practice.

When the quantity of explosives to be kept is small, not exceeding 150 pounds of dynamite or gunpowder, or not exceeding 2,000 detonators, satisfactory provision may be made for storage in outhouses or locked receptacles, under conditions to which reference will be made later. It will be convenient to consider here the disposal of larger quantities in buildings, permanent or temporary, properly styled "magazines".

ISOLATION OF MAGAZINES FOR PUBLIC SAFETY

The first question to be decided by anyone proposing to build a magazine should be its **location**. A magazine should be so situated that the accidental explosion of its contents is not likely to cause any serious damage to other buildings, or injury to individuals in places frequented by the public. It is reasonable also to provide for some variation in the degree of isolation demanded, having regard to the nature of the risks chiefly to be considered. Thus a greater degree of protection should be given to a dwelling house, presumably always occupied, than to a country road. If the occupant of a house agrees to the building of a magazine, the distance to be observed need not be so great as if he did not agree—the difference being not one of any serious risk to the inmates, but in the former case, if an explosion occurred, the house might be shaken or damaged to an extent calling for repairs, for which presumably the magazine owner would be responsible. Again, looking purely to material risks, buildings belonging to the owner of the magazine need not be so far removed from it as would be desirable were they the property of others. The minimum distances to which a magazine must be removed from other buildings or places, varying in each case on the lines indicated in the foregoing, are dependent on the maximum quantity of explosives which may be stored in the magazine at any one time. In this country the British "Table of Distances", compiled from a study of the effects of recorded explosions, is taken as a guide in determining the site for a magazine for a given amount of explosives. A short abstract of this table is given in the Appendix A. It should be remembered that these are minimum distances, and that it is always desirable, where practicable, to provide a greater degree of safety by observing greater distances. When looking for a site, attention should be paid to the possibility of finding one which will protect, by intervening high ground, any buildings or roads in the vicinity.

PROTECTION AGAINST LIGHTNING AND FIRE

When, having regard to the advantages offered by high ground as a shield between a magazine and other buildings, a site is found for a magazine close to a high bank, the chances of its being struck by lightning are certainly reduced. Whether so situated or in open flat country, magazines may well be provided with lightning conductors. Some of the larger ones are so equipped, but this is by no means general practice. It is

to be remembered that, to be effective, the fixing of lightning conductors must be closely supervised by a competent person, that their design be good, the material suitable, sharp bends avoided, and good grounding ensured. They should be tested periodically, as there is a danger of the effectiveness of the earth contact falling off, and so defeating the purpose of the conductors.

There is, judging by results, more cause in this country to fear bush fires than electric storms, despite the frequency of the latter. The clearance of the scrub around a magazine is a certain protection against ground fires and one which should always be taken. However, if a magazine is situated in a bush country it should be of brick, concrete, or other non-inflammable material. There was recently a case where a bush fire swept over such a magazine, leaving it and its contents unharmed.

SECURITY OF A MAGAZINE

No magazine can be made proof against unlawful entry. Given the opportunity, the implements and the skill, the most substantial of magazines can be broken into. On the other hand, although thefts from well-built magazines are not unknown, depredations are more likely to be made on magazines which may be forced without great difficulty. A magazine intended for permanent use should be of such substantial construction and so designed, as to cause as much difficulty as possible to anyone trying to break into it.

The degree of structural security should be greater in the case of a permanent magazine and one which is isolated. For such, the double-brick wall type of magazine has been extensively adopted, although in recent years, concrete construction has found favour. A double plank (2-inch) door faced with $\frac{3}{8}$ -inch boiler plate and fitted with a strong mortice lock (preferably with two locks) will provide security in keeping with the structure. For a semi-permanent magazine a double-walled frame building is a suitable type of construction. With a covering of galvanized iron and a filling of sand it may be made bullet proof; when shooting in its vicinity is not to be apprehended, the air space between the walls will still serve to reduce the extremes of temperature in the magazine. The substitution of non-inflammable roofing paper for galvanized iron on the outside, although not adding to the strength of the building, will at least act as a preservative and lessen the fire hazard. A

two-inch plank door covered with boiler plate will render the entrance to the building bullet proof if so desired.

In logging districts good serviceable small magazines may be readily built with flattened or "slabbed" logs, provided care is taken to avoid any interstices between the logs. The tendency to construct these small magazines in dug-outs—much in the style commonly adopted in making ice-houses—is generally to be deprecated on account of their liability to dampness. The bank in which the dug-out would be made would serve as a protective bank were a magazine built clear of it but in its shelter.

A few plans of magazines of different types are given in the Appendix B. These are not intended as specifications which should be adhered to, but as illustrations of how, with different materials and under different conditions, regard may be paid to the essentials of magazine construction.

OTHER FEATURES OF MAGAZINE BUILDINGS

The interior of a magazine should be kept **scrupulously clean**; it should be **reserved exclusively for the storage of the explosives** (save for such articles as brooms, magazine shoes, and mats) and there should be no exposed nails or iron.

In furtherance of this the walls and floor should present a smooth finish. This may be effected with close tongue and groove boarding, or the walls may be lined with beaver boarding or other material giving a surface not susceptible to the collection of dust, and which can be easily cleaned. In cement magazines a good surface can be obtained with a finish of neat cement. A good practice in wooden-lined buildings is to round off the junction between walls and floor with curved beading, or in cement buildings, to so form the junction. This helps to prevent the collection of dust around the edges and corners and also is a check against the undesirable practice of piling cases close to the walls. Given a condition that lends itself to ease in cleaning, steps should also be taken to exclude dirt, hence the provision of a door mat and shoes, or overshoes, to be kept in the building for the use of anyone entering. A convenient arrangement, which is shown in the plans, is to have a barrier between which and the main entrance may be kept mat, shoes, broom, mallet and wedge, and where also a peg may be fixed on which to hang up an overcoat. If, instead of a simple barrier, a substantial dividing wall with door and

lock is built, greater security is afforded. A copy of the magazine rules, and a notice giving the maximum quantity of explosives which may be kept in the magazine, should be posted in this entrance chamber.

It is important that explosives should not be kept in a damp atmosphere, and consequently a magazine should have good **ventilation**. Consideration should be given to the means whereby this may be attained without adding to the danger of malicious action from outside. Roof ventilators are usually of so open a nature as to admit birds or field mice, and they rarely offer much protection against drifting snow or wind-borne sand, or dust. Where roof ventilators have been used, as in some old magazines, it has been difficult to screen them so as to overcome this; and to do so in a way that would offer a really serious obstacle to malicious action has not been practicable. Wall ventilators are much more easily dealt with. Adequate ventilation can be given by two to four vents of 2 to 3 inches diameter made in the walls of a small magazine, above the flooring, and the same number near the ceiling. These vents should be made with double elbow bends—that is, two right-angled turns in the thickness of the wall—so that the aperture on the outside is lower than that inside. They should be protected by the fixing of a small mesh screen near the outer end to exclude dirt and a stronger grid farther in beyond the bends, as an obstacle to the malicious insertion of a fuse. This grid can be so placed as to render its cutting practically impossible unless a part of the wall be broken away. In a sand-filled double-wall building a vent can be readily made with pipe elbow joints. In small double frame, unfilled, magazines, there is no need of a conduit, but the hole in the inner wall should be bored a few inches above that in the outer, and the strong grid fixed to the inner, the fine mesh screen to the outer.

The leaving of openings in or around the floor to give access to air which has been allowed to enter by wall vents below the floor level, is not to be recommended. This practice is conducive to the accumulation of dust, including explosive matter, below the floor. It also encourages the harmful practice of sweeping outwards, instead of sweeping inwards and collecting and destroying the dust as should be done.

MAINTENANCE OF MAGAZINES

Enough has been said in the previous section to indicate the importance that is attached to cleanliness in magazines for explosives. Given a magazine which is so finished as to render

it easy of cleaning, it remains for the owner, by supervision, to ensure that whoever he puts in immediate charge of the magazine is diligent and careful in this regard. Foremost among standing instructions that the owner gives to his employees should be those regarding the exclusion of open lights or matches, and those calling their attention to the importance of wiping their boots and putting on **clean overshoes** on entering. A broom is kept in the magazine and its use should become a habit.

If a magazine has been built to a size suitable for the maximum quantity of explosives to be stored in it, there should be no occasion to pile the cases too high, even when a variety of brands are dealt with and are stacked separately. Cases should never be piled higher than would enable a man standing on the floor to handle a case on the top tier without difficulty.

Attention should be directed to the **turnover of the stock**—the older stock being issued first. There is always the tendency, when stock is low, and a new supply is taken into the magazine, for the small remainder of the old stock to be left at the back, and the cases nearest to hand taken for issue.

Nitroglycerine explosives, such as the dynamites, are liable to "sweat." This **sweating** is the exudation of nitroglycerine, and although greatly induced by storage in a moist atmosphere, it occurs sometimes under good conditions of storage. It may be mentioned that this is a condition which will slightly reduce the effectiveness of the explosive, but, what is more important, it renders it more sensitive to friction and yet more difficult of detonation in ordinary use. If the exudation is only slight, and the cartridges are used, it is advisable to employ a stronger detonator than would normally be taken—e.g. a No. 8 instead of a No. 6. Beads of nitroglycerine form on the outside of the cartridges, and after a time the exuded nitroglycerine will soak the bottom and lower parts of the sides of the cases, staining them noticeably. The sweating may be observed at an earlier stage if there has been occasion to open cases. In either event the cartridges in all affected cases should be visually examined, and if still serviceable, taken for early use, but they should not be issued unless the party receiving them understands their condition. If the sweating is so great as to render the cartridges unserviceable, they should be destroyed by burning. The fact that marked exudation has been found, if under good storage conditions, should be reported to the manufacturer or dealer who supplied them, and, if there is any doubt about the matter, his guidance sought in regard to the disposal of the explosives.

In most cases when nitroglycerine has been found exuded from cartridges in dry magazines, it has transpired that these had been returned to the magazine and their condition not questioned, and there has been strong reason to suspect that the party who had them previously in charge had not kept them under proper conditions. This may apply to the return by customers of left-over explosives, accepted by a dealer wishing to oblige his customers; or to the returns made by detached working parties, as in construction work, or river driving in logging, to their own main supply magazine. Therefore, any person in charge of a magazine should give a careful scrutiny to all old explosives he is asked to take into store.

Where exudation has occurred in a magazine and has seeped from the cases to the floor, the floor where affected should be thoroughly cleaned with a special preparation for the removal of nitroglycerine. Such a cleanser may be made by dissolving one pound of caustic soda, or Gillett's lye, in about one and one-quarter pints of water and adding one gallon of wood alcohol. If the latter is not obtainable then methylated spirits may be substituted, although not quite so efficient.

Chlorate explosives also absorb moisture from the atmosphere and this may cause the chlorate to diffuse through the paper cartridge wrapper and on drying to form crystals on the outside which are very sensitive to friction. Even when the chlorate does not diffuse through the wrapper, the cartridge, once having become damp, may become very hard on drying, which condition makes detonation difficult—in other words, may lead to a partial detonation or misfire. When the formation of crystals or the hardening of the cartridges is found to have taken place the issue of these for use should be held over pending reference to the dealers or manufacturers.

Cases of explosives should never be opened in a magazine. If a case has to be opened it should be removed to some distance from the magazine, and opened by means of a hardwood wedge and mallet or hammer of soft metal which should be kept in the magazine for use when required. Iron tools should never be used. The cover of the case should be replaced before returning the case to the magazine.

The cylindrical **canisters containing gunpowder** or black sporting or blasting powders should be stacked on their sides or, if more convenient, on their ends with the bungs down. They should be rolled over, and if necessary shaken but never knocked, every two or three months as a safeguard against the caking of the powder.

DESTRUCTION OF EXPLOSIVES

Drowning offers the simplest way of disposing of those explosives the constituents of which are soluble in water. Unfortunately, with the exception of the black powders, very few of the explosives in general use come under this category.

The others may still be safely disposed of in deep water in the open sea, or any other very large body of water, but in most cases recourse must be had to burning. To effect this the cartridges should be opened out and laid, slightly overlapping, on dry ground or on a plank, and a train of broken down cartridges followed by fuse, paper, or shavings laid in continuation of the line of cartridges and of sufficient length to enable one to get 100 yards clear before the explosive ignites. The whole should be placed so as to burn against the wind. If burned with the wind it is possible that the fire will spread so rapidly through the mass as to cause a development of heat sufficient to bring about an explosion.

It is advisable to sprinkle petroleum or other oil over the cartridges to facilitate ignition.

After burning care must be taken to see that no smouldering embers remain, and that all the explosive has been consumed. Unless absolutely necessary the same ground should not be used again, but if this has to be done, it should be well watered and the next line of cartridges placed on planks.

Certain explosives containing borax should not be destroyed by burning as they are extremely liable to detonation when ignited. It is preferable to explode them in small quantities, or to drown them in deep water.

Never bury old explosives, as the nitroglycerine contained in them does not deteriorate with time but maintains its explosive force. Many instances have occurred in which men have lost their lives through the explosion of nitroglycerine that had lain for more than twenty years in the ground, in crevices of the rocks, or under water.

Great care must be taken to ensure that no detonators or electric blasting caps are among the explosives to be burnt, and if any primed cartridges are to be destroyed they should be dealt with separately and exploded.

Before undertaking the destruction of any large quantities of explosives it is advisable to consult the Explosive Division as to the best method to be employed, as there may be factors in particular cases that suggest the advisability of special treatment.

DETONATORS

Detonators or electric detonators must never be stored with dynamite, black powders, or other explosives. If a large stock of detonators is carried, a small magazine building should be specially erected for its accommodation. Generally this building is conveniently placed in the same locality as the main magazine but at least 50 to 100 yards therefrom, depending on the quantity to be stored. Sometimes a small outhouse may be adapted for use, exclusively, as a store for detonators, and if sufficiently removed from other buildings is suitable for, say, 20,000 detonators. Any such place which may be approved for keeping more than 2,000 detonators is technically a "magazine" and can be covered in the same licence as is given for the main magazine.

Detonating Fuses such as Cordeau-Bickford and Primacord must not be kept with detonators, but should be stored in the dynamite magazine. Ordinary **Safety Fuse** should be kept apart from detonators. It may be stored either with the dynamite or in an unlicensed building which has been selected with due regard to fire hazard.

KEEPING OF RECORDS

A careful account should be kept of the receipts of explosives to a magazine and their issue from it, and care taken to keep the maximum stock within the limit allowed for the magazine.

In the case of a magazine from which issues are made to shot firers, the number of sticks of explosives, and the number of detonators given out and returned should be checked with the numbers actually used, and every precaution taken to ensure that no explosives have been "misaid" or lost in the open, as such may be the cause of subsequent accident.

LICENSING OF MAGAZINES

If a magazine be used solely for the keeping of explosives at a mine or quarry which is subject to the inspections of Provincial Government officials, as Inspectors of Mines, its building and maintenance is governed by regulations made under the Mines Act or similar statute of the province. Not all provinces, however, assume this jurisdiction, and among those which do, there is a variation in the definition of the term

“mine,” and accordingly in the class of mine or quarry magazines liable to Provincial Government inspection. All magazines not covered by Provincial Government inspection, except naval and military magazines, are required to be licensed under the Explosives Act of Canada. This applies to all magazines owned or operated by merchants selling explosives, or by persons keeping the explosives for their own use—other than in a mine or quarry as above. The issue by a Provincial Government of licence to sell explosives does not absolve the dealer from obtaining a licence for his magazine as required by the Explosives Act. The fee for these licences is merely nominal one dollar yearly, but its issue is conditional on the magazine being found suitable for the purpose, and on its maintenance in accordance with the regulations, all of which aim at the establishment of safe conditions. Anyone desiring to establish a magazine and obtain a licence should communicate with the Chief Inspector of Explosives, Department of Mines and Resources, Ottawa, indicating briefly the type of magazine he proposes to build, its location, and the maximum quantity to be stored in it. Appropriate instructions can then be given regarding the procedure to be followed, and on other matters connected with the particular case. When first making application for a magazine licence, mention should be made of detonators. This is apt to be overlooked, but it is well to obtain instructions in regard to the storage of detonators at the same time—even if the number to be kept is not sufficient to require a licensed building.

THE KEEPING OF SMALL QUANTITIES OF EXPLOSIVES

Magazines, whether temporary or permanent, and whether owned by users of explosives or by merchants, are but depots from which supplies are distributed to meet the wants of parties requiring relatively small quantities for immediate use or desiring to hold small quantities available for use or retail sale. Consequently magazine owners form only a small body compared with that comprising those who may have explosives in their possession, such as foremen in charge of detachments of construction parties, men engaged in logging operations, mining prospectors, farmers requiring explosives for land clearing, and many others besides retail merchants.

The effect of an accidental explosion of a small quantity is certainly confined to a very limited area, as compared with that of the explosion of the much larger quantity usually to be found in a magazine. A magazine, however, as has been seen, is placed with due regard to the probable effect of the explosion of its maximum contents over a distance. The location of a small store of explosives will also call for consideration but it may be of interest here to compare the dangers attendant on the keeping of explosives in magazines, and those on the keeping of small quantities elsewhere.

The greater effect of the explosion of the larger quantity is guarded against. The risk of accident with the small quantity will be much greater, until all persons having charge of explosives handle them with the same care as is habitual with those operating magazines. This does not necessitate any technical knowledge; it merely calls for the exercise of common sense in the separate and secure keeping of explosives, the avoidance of the use of such unsuitable tools as axes, nail pullers, jimmies, wrecking tools and the like in opening cases; the prohibition of smoking or carrying of naked lights in their vicinity; and the cultivation of cleanliness and orderliness in all connected with explosives. In the course of the last six years, for which records are readily available, there has been no explosion or fire in a licensed magazine save when a magazine was destroyed by a bush fire, no one being injured. On the other hand cases have occurred, and have caused loss of life and serious injury, where one or two boxes of explosives having been left entirely unprotected, invited accident.

It is not suggested that an explosion en masse is common even in the case of small stocks. Fortunately it is not so, but the risk attendant on improper conditions of storage is nevertheless a very real one.

Neglect to safeguard and to account for all the explosives in one's keeping is what makes possible accidents of another class which are unhappily far too common. Every year in the annual report of the Explosives Division, Department of Mines and Resources, there is published a summary of accidents of which information has been obtained. The high proportion of accidents brought about by playing with explosives is very striking. In 1938 there were 51 so classed out of a total of 163. During the past eleven years there have been recorded 447 accidents caused by playing with explosives, and these resulted in the death of 29 and injuries to 542. Nearly all these casualties were children who had "found" explosives and, not unnaturally, played with

them. The explosives involved may have been lost and forgotten, or merely being kept by their owners without proper safeguard.

Carelessness on the part of anyone having occasion to keep or use explosives, that results in explosives being left exposed, cannot be condoned. Such carelessness constitutes a violation of the regulations under the Act, whether it is a question of the manner of keeping explosives in licensed magazines, or of the proper custody of small quantities in unlicensed premises. There is no reason to believe that magazine owners or retail dealers, such as hardware merchants, are at fault in this respect. Their arrangements for storage are of a more or less permanent character; they are known and subject to inspection.

The main sources of the trouble are to be found in temporary arrangements made, and too often in the very casual methods adopted by work parties, such as are employed on road work, or in cities in the excavation of foundations, opening sewers, and the like. These parties require relatively small quantities of explosives, and for but a short time. Although the quantity of explosives is rarely so large as to call for storage in a licensed magazine, the persons keeping explosives in operations of this character are required, equally with the retail dealer, to keep them in a secure and proper manner.

In the discussion on magazines, relative to the determination of what would be necessary for the provision of reasonable security, attention was called to the question of isolation, to the extent to which the magazine would be under supervision, to the period for which it would be required and to the materials available for its building.

The same factors must affect the decision of what would constitute appropriate conditions of storage for small quantities, that is, of quantities not exceeding three cases. Indeed, it is frequently the case that the explosives are required for a very short period, and that they are in the charge of the foreman of a gang of men employed on construction work or in the bush—that is, under conditions which should incidentally provide for the maximum of supervision, the minimum of risk of malicious action by others, and the minimum of danger to the public when the work is conducted in unsettled localities. Even so, the explosives should be locked up in an outer container, the detonators being in a separate locked box. There should be no difficulty in finding a place for the receptacle well clear of, but convenient to, the work—say, 100 yards distant.

In all cases the greatest care should be taken to keep a tally of the sticks of dynamite and the number of detonators issued for use and returned, so that none may be left on the ground after the work is finished. In the same way the returns, by detached parties, to a main store, should be checked up. Not only have stray dynamite cartridges or detonators been picked up long after operations have ceased in a locality, but explosives have been found in bulk. It may be that they were forgotten or that they were not considered to be worth the cost or labour of removal. They should never be forgotten, and if not wanted should be destroyed.

The cases, somewhat of the size and shape of piano cases, commonly seen used by contractors on road and municipal work, are very frequently used for the keeping of the explosives required. This is satisfactory if the case is used solely for the dynamite or powder, kept locked, and marked "explosives." Unfortunately, these and similar tool chests have too often been found to contain dynamite, detonators, and miscellaneous tools—a stage well set for accidental explosion.

Farmers and others whose need for explosives may be temporary or recurrent are in a position to select a place of storage which would be available whenever required. Sometimes a small outhouse may be appropriated for this, or a compartment built in a shed not used for keeping combustible material. However, the building of a small separate hut sufficiently large to contain three cases need not involve much labour. Whichever course is followed the place selected should be preferably 100 yards from a dwelling house, but easy of access and supervision.

Hardware merchants and others who hold explosives for retail may in the same way provide small detached stores, or compartments in selected detached buildings, for the accommodation of the restricted supplies which may be kept without a licence, but which exceed the quantity which may be held in receptacles in their stores, immediately available for retail.

In regard to the limited quantities which may be kept in business premises or in private houses, the dangers to be avoided are, in the main, those arising from their rough handling by persons not fully appreciating the attendant risk; or rough handling incidental to their being so placed as not to be readily distinguished from other non-explosive goods; or, particularly in the case of explosives kept in dwelling houses, their falling into the hands of children.

The regulations under the Explosives Act limit the amount to be kept for sale in locked receptacles, to 25 pounds of gunpowder—which may include not more than 10 pounds of blasting cartridges, one pound of these being reckoned as two pounds of gunpowder. Two hundred detonators may also be kept in a separate locked receptacle. The places selected for these receptacles must be away from goods of an inflammable character and they should be easily accessible for removal in case of fire. The private owner is allowed 20 pounds of gunpowder and, in addition, if his house be not in any town or village, 20 pounds of blasting cartridges and 200 detonators. The separation of blasting cartridges from the detonators is again called for, as is the keeping of both under lock and key.

Persons who keep explosives for sale are also required to keep records showing the quantities they receive and from whom, also the names of the persons to whom sales are made with particulars of date, quantity and nature of the explosive. These records apply also to rifle and revolver cartridges of larger calibre than .23 inch, but not to shotgun cartridges.

The dealer is at the advantage, or disadvantage, according to his point of view, of being subject to inspection. He is, moreover, advised as to the manner in which explosives may be lawfully kept, and to what extent.

The private user is also liable to inspection, but even were it desirable, which it is not, to extend routine inspections to cover this, it would be wholly impracticable. A word of caution may not, however, be amiss. The danger he has to fear is seldom theft, or accident to himself, but that the explosives may fall into the hands of others of his household. Too frequently explosives have been put away, but not locked up, in some presumably safe place, only to be brought to light by children, with tragic consequences. The first care, therefore, should be to see that the explosives are kept under lock and key.

APPENDIX A

ABSTRACT FROM BRITISH TABLE OF DISTANCES

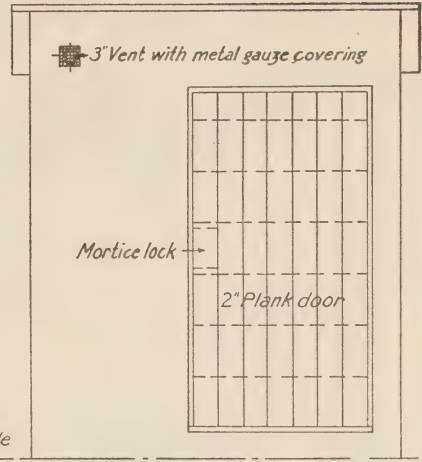
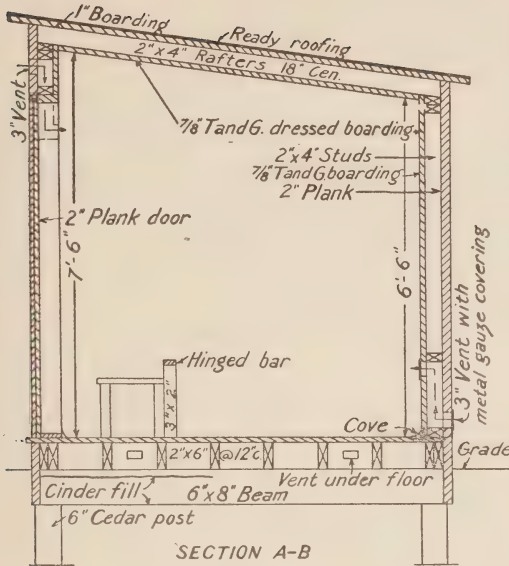
Amount of explosives to be allowed in the magazine.....	lb. 500	lb. 1,000	lb. 2,000	lb. 5,000	lb. 10,000	lb. 15,000	lb. 20,000	lb. 25,000	lb. 30,000	lb. 40,000
	yd.	yd.	yd.	yd.	yd.	yd.	yd.	yd.	yd.	yd.
Distances in yards to be kept clear from: high-way, canal, pier, open place of resort, mineral or private railway.....	50	75	100	104	110	115	120	125	130	140
Any other magazine or store for explosives.....	100	150	200	200	200	225	250	288	325	400
Public railway.....	100	150	200	225	265	300	330	364	395	460
Dwelling house with occupant's consent.....	50	75	100	130	175	215	250	288	325	400
Dwelling house without occupant's consent, church, school, or other building where people are wont to assemble.....	100	150	200	320	525	690	850	1,025	1,200	1,525

NOTE.—For quantities of over 1,000 pounds where good protection is afforded either by substantial artificial mounds or by the natural features of the ground, the distances given above may, at the discretion of an inspector of the Explosives Division, be reduced to one-half of those shown in the table.

APPENDIX B
PLANS OF MAGAZINES

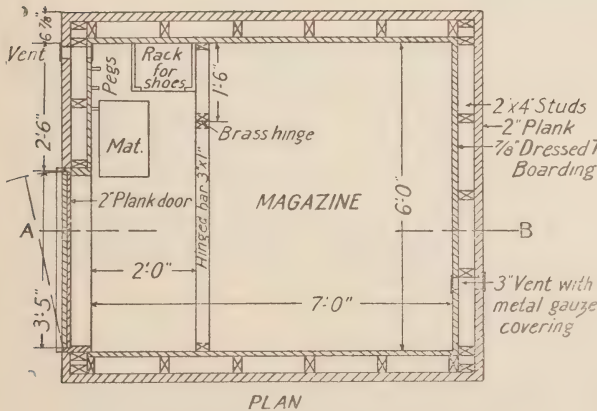
MAGAZINE FOR EXPLOSIVES

PLAN No. 1



ELEVATION

Scale of Feet

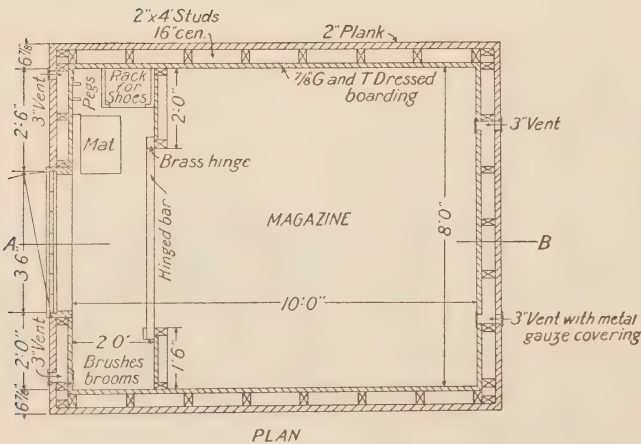
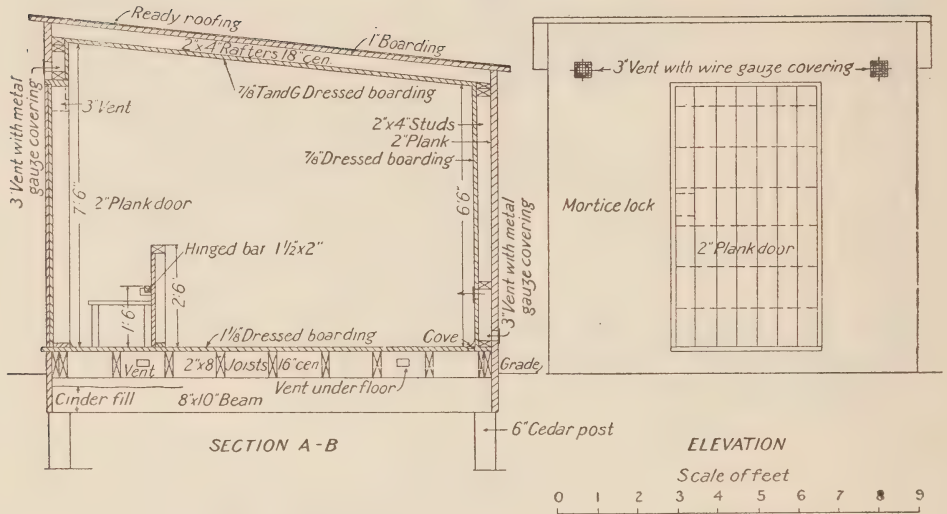


Double-walled wood magazine, which not giving protection against chance rifle shots or offering serious obstruction to forcible entry, is suitable only where the danger of rifle fire need not be considered, and when so situated as to be under the easy observation of the owner or his representative.

Capacity 75 cases, with cases piled not more than five high. For 100 cases (approx. 5,000 pounds) two feet should be added to length. (Divide total number of cases by number of tiers (5) and multiply by two to give floor space required.) In districts with a heavy snowfall the pitch of the roof may be increased.

MAGAZINE FOR EXPLOSIVES

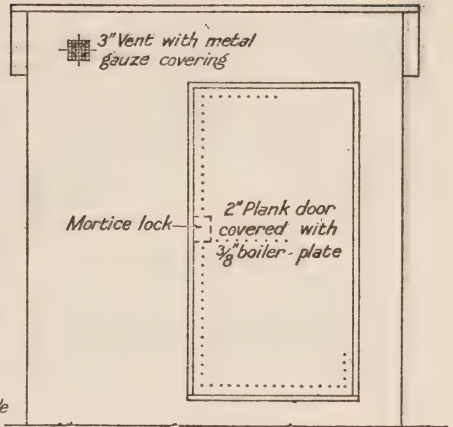
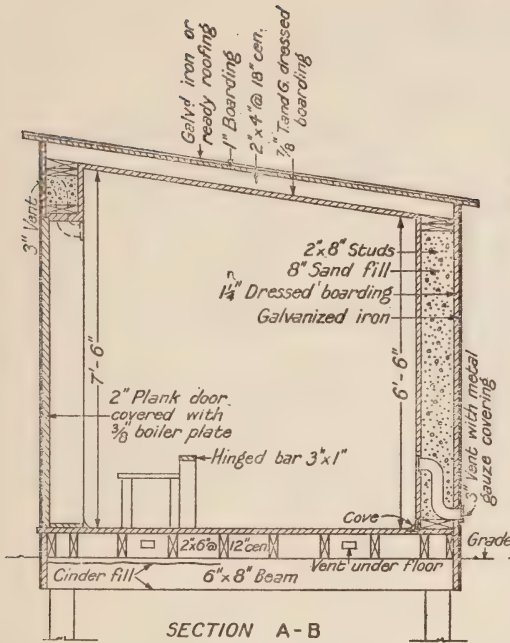
PLAN No. 2



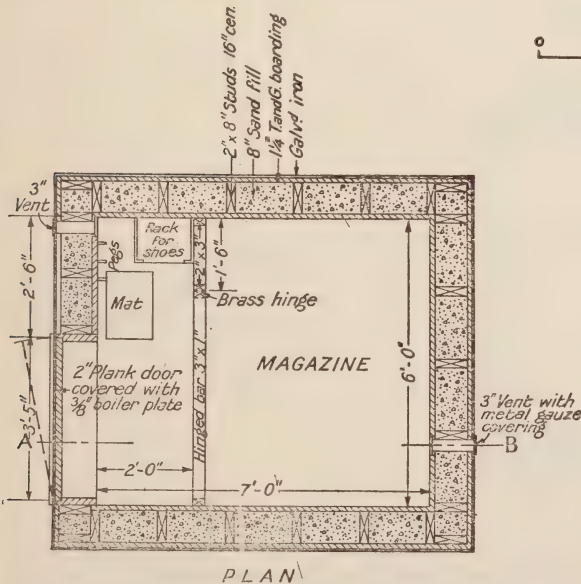
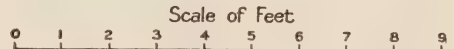
Double-walled wood magazine, which not giving protection against chance rifle shots or offering serious obstruction to forcible entry, is suitable only where the danger of rifle fire need not be considered, and when so situated as to be under the easy observation of the owner or his representative.

Capacity 8,000 pounds, with cases piled not more than five high. If accommodation is required for larger stocks, design should be suitably altered to give proportionately increased floor space. (Divide total number of cases by number of tiers (5) and multiply by two to give floor space required.) In districts with a heavy snowfall the pitch of the roof may be increased.

MAGAZINE FOR EXPLOSIVES PLAN No. 3



ELEVATION

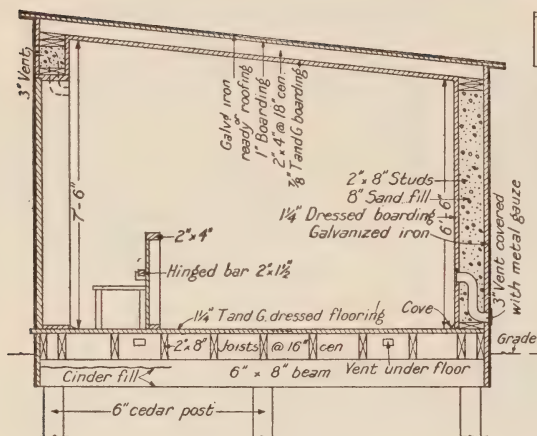


Double-walled wood magazine with sand filling and shielded door giving reasonable security, for a semi-permanent magazine, against chance rifle shots and forcible entry.

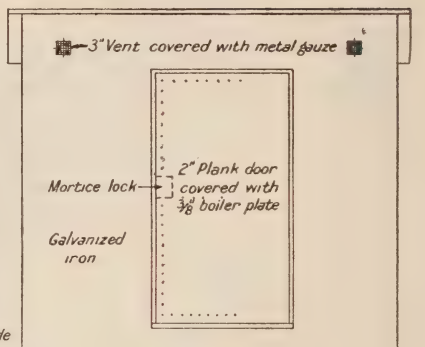
Capacity 75 cases, with cases piled not more than five high. For 100 cases (approx. 5,000 pounds) two feet should be added to length. (Divide total number of cases by number of tiers (5) and multiply by two to give floor space required.) In districts with a heavy snowfall the pitch of the roof may be increased.

MAGAZINE FOR EXPLOSIVES

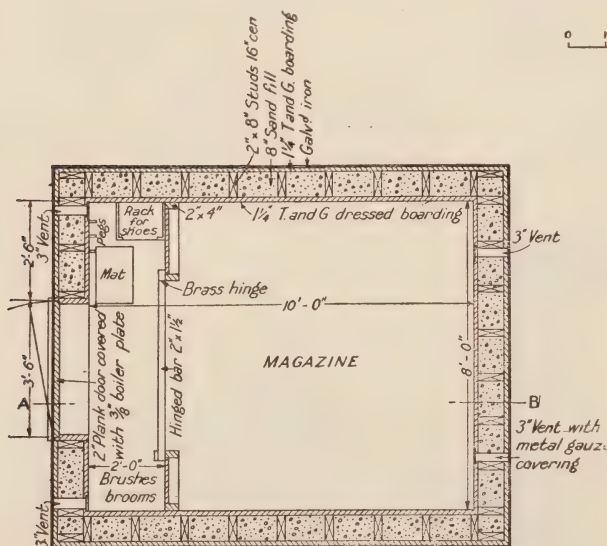
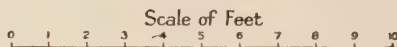
PLAN No. 4



SECTION A-B



ELEVATION



PLAN

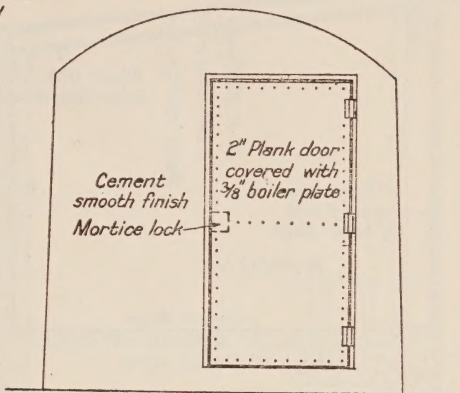
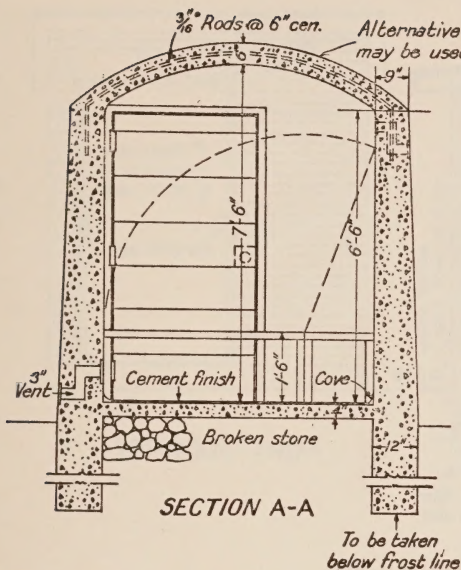
Double-walled wood magazine with sand filling and shielded door giving reasonable security, for a semi-permanent magazine, against chance rifle shots and forcible entry.

Capacity 8,000 pounds with cases piled not more than five high. If accommodation is required for larger stocks, design should be suitably altered to give proportionately increased floor space. (Divide total number of cases by number of tiers (5) and multiply by two to give floor space required.) In districts with a heavy snowfall the pitch of the roof may be increased.

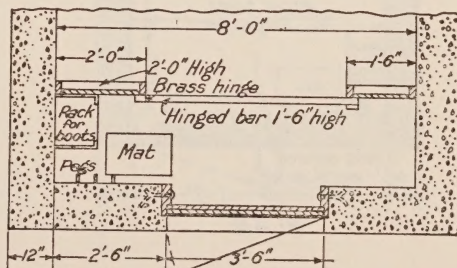
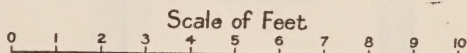
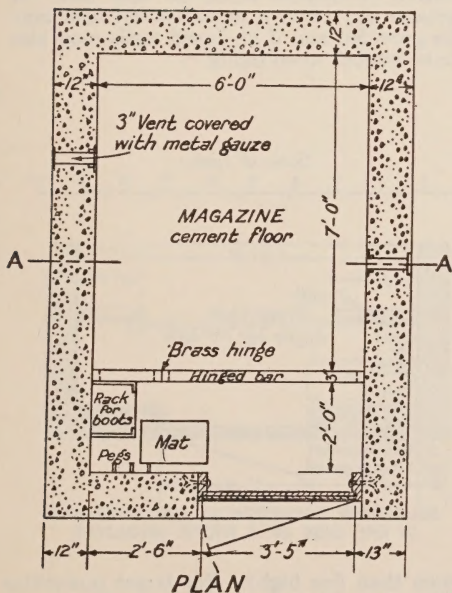
MAGAZINE FOR EXPLOSIVES

PLAN No. 5

(Concrete)



Floor and inner surface of walls to be given smooth finish of clean cement. As an alternative to smooth finish on floor and for greater durability a smooth wood floor may be provided and if preferred the required smooth interior may be obtained by wood lining to walls.

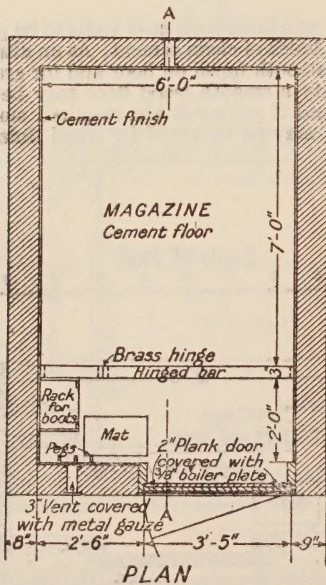
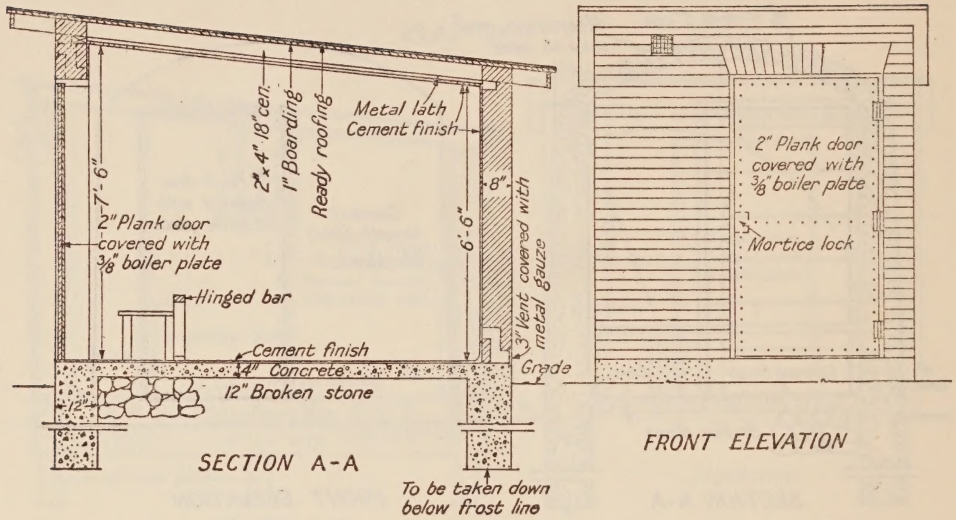


Capacity 5,000 pounds (100 cases piled not more than five high). For larger quantities divide total number of cases by number of tiers (5) and multiply by two to give floor space required. In districts with a heavy snowfall the pitch of the roof may be increased.

MAGAZINE FOR EXPLOSIVES

PLAN No. 6

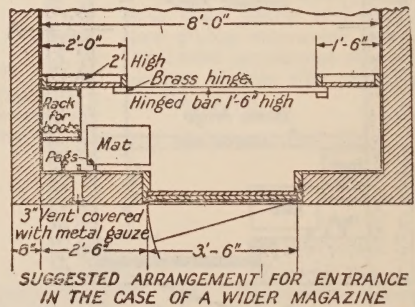
(Brick)



Floor and inner surface of walls to be given a smooth finish of clean cement. As an alternative to smooth finish on floor and for greater durability a smooth wood floor may be provided and if preferred walls may also have smooth wood lining.

Scale of Feet

0 1 2 3 4 5 6 7 8 9 10



Capacity 5,000 pounds (100 cases piled not more than five high). For larger quantities divide total number of cases by number of tiers (5) and multiply by two to give floor space required. In districts with a heavy snowfall the pitch of the roof may be increased.

Don't hide explosives—lock them up.

Don't keep explosives with tools.

Don't keep detonators and blasting explosives together.

Don't leave explosives accessible to children.

Don't smoke or have fire or naked lights near explosives.

Don't neglect to check all explosives issued, used, and left over each day.

Don't forget to lock up unused explosives.

Don't bury old explosives—shoot them, burn them, or drown them.
